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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 34. November, 1931. No. 395.

ON THE "PAPILLOSE" ACHENES IN THE GENUS ANTENNARIA

MORTEN P. PORSILD

THE Old World and, consequently, the longest known species: *Antennaria dioica* (L.) Gaertn., *A. alpina* (L.) Gaertn. and *A. carpathica* (Wahl.) Bl. & Fingerh. and their remarkably few trifling aberrations have GLABROUS achenes. This fact has been stated in a few works. Most of the floras and descriptive books, however, do not mention the achenes of *Antennaria* at all; even "old faithful" HARTMAN, who generally in his Handb. Skand. Fl. 11 Edit. Stockholm 1879 gives a brief but fairly correct description of seeds and achenes where nobody else does so, fails here. In North America, where during the last thirty years about 150 new species have been detected and described by such writers as E. L. GREENE, M. L. FERNALD, P. A. RYDBERG, E. NELSON and others and where, accordingly, suitable characters for discerning the often difficult species would seemingly be needed, even the modern floras and handbooks content themselves in stating that the achenes of *Antennaria* are "terete or nearly so." This is curious since the great majority—if not all—of the species in the Atlantic States of U. S. A. have very distinct granular papillae on their achenes, by which character alone the long lasting confounding of American species with the Old World *A. dioica* might have been avoided.

Yet, papillose achenes in *Antennaria* have in some cases been mentioned by American botanists. The following list is probably very incomplete, owing to the present writer's lack of access to the literature. We find:

1897. Pittonia III.	173.	A. NEGLECTA Greene described as having achenes "copiously papillose."
	174.	A. HOWELLII Greene "papillose granular."
	175.	A. PEDICELLATA Greene "very minutely and sparsely granular."
	184.	A. NEODOICA Greene "rather coarsely and obviously granular."
1898.	277.	A. "PLANTAGINIFOLIA" (=A. PARLINII Fern.) "nearly destitute of papillae."
1903. Pittonia V.	111.	A. MESOCHORA Greene "globular papillose."
1921. RHODORA XXIII.	295.	A. APPENDICULATA Fern. "papillose."
1924. RHODORA XXVI.	102.	A. SUBVISCOSA Fernald "papillose."
		A. ISOLEPIS Greene "sparingly papillose" (*Fernald*).

Thanks to the courtesy of Professor FERNALD I have been able to investigate a large number of the Atlantic American species of *Antennaria* in well authenticated specimens. I shall here enumerate the cases where I have noticed papillose achenes, as some of them seem not to have been mentioned before.

A. PARLINII Fern. (*A. arnoglossa* Greene). North Berwick, Me., June 12, 1897, *J. C. Parlin*, (2 sheets); Orono, Me., May 30, 1901, *M. L. Fernald* (2 sheets).

Achenes at full maturity (N. Berwick plant) rather large, 1.79–2.07 mm. long, 0.42–0.50 mm. broad. Papillae evenly dispersed over the whole surface, but rather small. (FIG. 1, a.)

A. CANADENSIS Greene, toward var. RANDII Fern. Farmington, Me., June 20, 1897, *C. H. Knowlton.*

Achenes not quite mature, 1.20–1.40 × 0.34–0.42 mm. Papillae as in above, probably somewhat larger. (FIG. 1, b.)

A. PLANTAGINIFOLIA (L.) Richards. Stoneham, Mass., May 23, 1895, *W. P. Rich.*

Achenes very young, but evidently papillose.

A. NEODOICA Greene. Wells Beach, Me., June 22, 1898, *Kate Furbish.*

Achenes mature, 1.29–1.46 × 0.34–0.39 mm. Papillae slightly scarcer in number and longer than in the preceding.

A. NEODIOICA var. RUPICOLA Fern. Island Falls, Me., June 9, 1898, *M. L. Fernald.*

Achenes quite young, but distinctly papillose.

A. NEODIOICA var. GASPENSIS Fern. Gaspé Co., Qué., *Pl. Exsicc. Gray.* 291.

Achenes immature, rather sparingly papillose.

A. NEODIOICA var. GASPENSIS Fern. Mt. Pembroke, Matane Co., Que., July 16, 1923, *Griscom & Pease*, 26,058.

Achenes immature, but copiously papillose.

A. PETALOIDEA Fern. Foxcroft, Me., June 6, 1898, *M. L. Fernald*, 2390 (2 sheets).

Achenes well mature, 1.48–1.60 × 0.39–0.48 mm., papillose; Harwich, Mass., May 11, 1919, *Fernald*, 19,243: mostly male specimens, one immature pistillate papillose. (FIG. 1, c.)

A. PETALOIDEA var. SUBCORYMBOSA Fern. Pr. Edw. Isl., June 29, 1914. *Pl. Exsicc. Gray.* 292.

Achenes well matured, papillose.

A. PETALOIDEA var. SCARIOSA Fern. Orono, Me., June 3, 1898, *M. L. Fernald.*

Achenes nearly mature, papillose. Same locality, May 30, 1901, *M. L. Fernald.* Achenes immature, papillose.

A. SPATHULATA Fern. St. Johns Island, Newfdl., July 31, 1925, *Fernald et al.*, 29,183.

Achenes mature, 1.23–1.37 × 0.36–0.42 mm., often somewhat angled; base of style longer than in other species, up to 0.20 mm. long; achenes papillose (FIG .1, d.).

A. SPATHULATA var. CONTINENTIS Fern. & St. John. Burnt Cape, Newfdl., July 17, 1925, *Fernald et al.*, 29,184.

Achenes nearly mature, papillose.

As will be seen, all the species here enumerated as well as most of those stated by Greene to have papillose achenes belong to the large-sized groups of species flocking around *A. plantaginifolia* or around *A. canadensis* or *A. neodioica.* Of the small sized species from localities abundant in Arctic types, FERNALD states l. c. as having *glabrous* achenes: A. ALPINA (L.) Gaertn (!); A. SORNBORGERI Fern.; A. CANA (Fern. & Wiegand) Fern. (several sheets!); A. ALBICANS Fern. (!); A. STRAMINEA Fern.; A. PEASEI Fern.

Of the species marked by a (!) I can but verify this statement as shown by specimens kindly sent me by Professor FERNALD. And to the series I can add *A. vexillifera* Fern. from a part of the type collection.

Of *A. straminea* I have not seen the type described in 1914 and redescribed in 1924, RHODORA XXVI. 100, in which last place the achenes are said to be glabrous. But a later collection, also from Newfdl. *Fernald et al.*, 27,187 contains specimens with well matured achenes, 1.40–1.46 × 0.42–0.45 mm. which are very distinctly papillose. Because of the real nature of the "papillae" which will be treated subsequently, I can hardly think that the same species may sometimes have and sometimes lack that character, so there seems to be some mistake in one of the two collections.[1]

Of the species of *Antennaria* thus far known to me from Greenland I have seen papillose achenes in two species, one of which is a rather stout plant seen in a large number of specimens from about 10 localities in West Greenland, ranging from 66°–71° Lat. N. and which I have supposed to be conspecific with *A. subviscosa* Fern., but which Professor FERNALD is treating as a Greenland endemic, *A. affinis* Fern. The other is a dwarfish species from the southernmost parts in

[1] The type of *A. straminea* has glabrous achenes.—M. L. F.

Greenland and in the field confounded with *A. groenlandica* Porsild, the most common *Antennaria* species in this section. I am unable to identify it; it is probably a new species.

Antennaria species of Greenland with glabrous achenes are *A. alpina* (L.) Gaertn., *A. angustifolia* Elis. Ekman, *A. glabrata* (Vahl) Greene, *A. intermedia* (Rosenv.) Porsild, *A. groenlandica* Porsild, *A. Porsildii* Elis. Ekman and two or three still unidentified species resembling Fernald's species *A. vexillifera*,[1] *A. cana* and *A. albicans* respectively.

From the Rocky Mountains of Alberta I have 7 sheets of *Antennaria*, kindly presented by Dr. M. O. MALTE. They represent, I think, 4 or 5 species, but they are unknown to me. All have glabrous achenes.

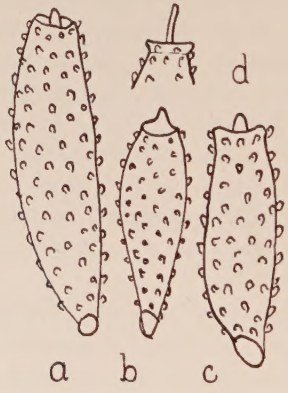

Fig. 1. Mature Achenes of *a:* ANTENNARIA PARLINII; *b:* A. CANADENSIS; *c:* A. PETALOIDEA; *d:* A. SPATHULATA; all × 16.

At full maturity the achenes of all the *Antennarias* investigated are very much alike as to form (FIG. 1.) They are terete, slightly tapering towards both ends so that the largest diameter is generally in the upper half. The pappus-bristles are united into a very short tube, breaking off as a whole and leaving an annular crown in the center of which the base of the style remains as a projecting short pointed tip. The outer wall of the achene is brownish with a faint fatty lustre. The cells of the epidermis are thick-walled, narrow, with square ends, forming regular longitudinal series. At the lower end of the achene is a globular nodule of thick-walled, uncolored cells, forming the part inserted in the pits of the receptacle.

[1] A. BREVISTYLA Fern., published in this issue.—M. L. F.

When "papillae" are present, they are uniformly dispersed from the nodule to the pappus-crown. In the species there are small variations in the length and the density of the papillae from species to species, whereas they are remarkably uniform in the same head. Still I doubt that a species can be identified from these variations alone. On the dry and mature achene they appear as hyaline reflecting granules, easily seen by enlargements from 25 times upwards.

When the achenes are thrown into water they are only with difficulty wetted but will float for a long time. Still when they, after treating with a soft brush, are forced down, their specific gravity is shown to be greater than that of water. Having been soaked in water for 24–48 hours the "papillae" project well out from the surface as short gland-like hairs, bifurcated at the top. This result can be obtained more rapidly by placing the achenes in solutions of caustic soda or of chloral hydrate, or, better still, by placing the dry achenes directly in chloriodine of zinc. After a couple of hours they will have swelled,

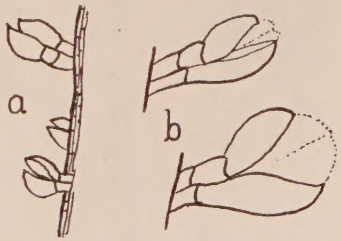

Fig. 2. Achenial Hairs swollen, *a:* of ANTENNARIA PETALOIDEA, × 133; *b:* A. NEODIOICA, × 265, showing drops of mucilage.

their upper halfs then being stained blue, the lower light yellow, contrasting well with the brown wall-cells. In strong solutions of chloral hydrate the terminal cells will finally distend to nearly a right angle. The forms of the hairs of the mature achenes will appear from FIGURES 2, a and b. They are essentially identical for all species investigated. They are always slightly directed upwards, and the lower terminal cell is always larger than the upper. In one instance I have seen a globular drop of mucilage in nearly all hairs on some half a dozen achenes contained on one slide, but unfortunately I have not been able to repeat the observation (FIG. 2, b). As plant mucilages generally have the same refraction exponent as water or watery solutions and as they are not colored with ordinary chemicals, they are always somewhat difficult to see. As, according to MOLISCH:

Mikrochemie der Pflanze. Jena 1913 p. 314, mucilage may be dissolved by chloral hydrate, this substance should be avoided where the occurrence of mucilage is studied.

These hairs evidently represent a form of the curious and very polymorphous *duplex hairs* or *twin hairs* occurring on the achenes of a great number of genera of the *Compositae*. In spite of the fact that these very peculiar organs with their still hardly understood functions (if any, some secreting mucilage, others containing elastic spires, elaters) seem to occur in all tribes of the *Compositae*, so as to be simply a main character for the whole family, they are generally not mentioned in the handbooks, either of taxonomy or of anatomy, not even in the elaborate treatment of the family by HOFFMANN in ENGLER & PRANTL, Pflanzenfamilien. An exception is HEGI'S Illustrierte Flora von Mittel-Europa, VI.[1] p. 399, where a brief description, illustrated by some figures from a paper of HANAUSEK is given.

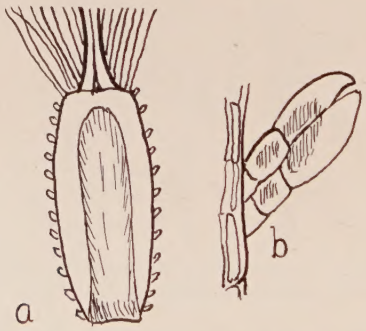

Fig. 3. *a:* Young Ovary of ANTENNARIA NEODIOICA, var. GASPENSIS, shown in optical section, × 16; *b:* achenial hairs, showing cell-contents, × 265.

In his most valuable and suggestive work "The Origin and Development of the Compositae" JAMES SMALL gives[1] a brief but clear account of the principal types of twin-hairs and their occurrences in the generally adopted tribes of the *Compositae*. He also gives a bibliography reaching from 1861 to 1912, to which may be added: HANAUSEK: Zur Entwicklungsgeschichte d. Perikarps v. Helianthus annuus. Ber. D. Bot. Ges. 20. 1902. Professor SMALL and most of the previous writers quoted by him seem to ascribe to the twin-hairs great value as bearing on evolutional questions.

[1] J. Small, New Phyt. xvii. 72 et seq. 1918.

The hairs on the achenes of the *Antennarias* are nearly developed before the heads and the corollas expand. In lack of alcoholic material herbarium specimens will easily show them after a boiling in water, with a few drops of chloral hydrate added, and a subsequent transferring into alcohol for hardening. FIGURE 3, a, shows quite young and transparent achenes of *A. neodioica* var. *gaspensis* and FIG. 3, b, one of the hairs still with contents in the cells.

In dealing with the twin hairs of the *Compositae* HEGI says l. c. p. 399: "In vielen Fällen sondern die verdickten Haarzellen Schleim ab, welch' letzterer bei der Quellung im Wasser gleichsam ausgestossen wird. Auf diese Weise umgibt sich die Frucht mit einem klebrigen

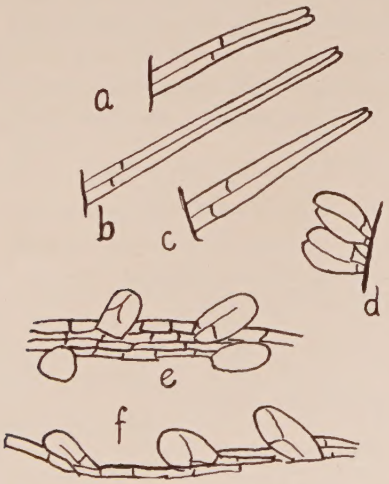

Fig. 4. Achenial Hairs swollen, *a:* of GNAPHALIUM NORVEGICUM; *b:* of G. SUPINUM; *c:* of LEONTOPODIUM ALPINUM; *d:* of FILAGO ARVENSIS; *e* and *f:* of ANTENNARIA PETALOIDEA, young staminate plant; all × 133.

Ueberzug, wodurch ein Festkleben der Achaenen an der Unterlage ermöglicht wird." From the quotation it cannot be seen whether this refers to an actual observed case or is merely a conjecture *per analogiam*. In our case such a function probably cannot be of much importance considering the minuteness of the mucilage drops in proportion to the size of the achene. A great number of species, probably the greatest part of the genus, have totally glabrous achenes and do quite as well. And I may here add that the abortive ovaries of the staminate plant of *A. petaloidea* also carry twin hairs, see FIG. 4, e and f. My

material was very young, taken before the corollas were expanded, so I cannot tell whether the hairs will develop to normal size and form. Here at least there cannot be such a function. Undoubtedly the hairs are an old character inherited from ancestral forms and in this connection it is interesting that fertile and apogamic species occur in both groups, those with hairs and those without.

James Small as well as the authors he refers to seems to be fairly convinced of the importance of the occurrence and the form-types of the achenial hairs in questions of interrelationship and evolution. Having, in Greenland, no access to the extensive literature on the subject, the present writer is unable to compare the conditions found in *Antennaria* with the cases known before. I could only look over the achenes of some genera and species which, according to the adopted taxonomy, are considered near relatives of *Antennaria*. And as my herbarium generally consists of specimens from Arctic or Alpine regions only, the suitable material was sometimes rather defective.

Gnaphalium.

The achenes of the boreal Old World species are partially described in the leading floras. Of these *G. arenarium* and *G. luteoalbum* would seem especially inviting for our purpose, but they are not at hand. The achenes are characterized thus:

	Hartman: Handb. Fl. Sk. 1879	Rouy: Fl. de France. Vol. 8	Hegi: Illust. Fl. Mitt.-Eur.
G. arenarium	glatta, grynprickiga	0	sehr feinknotig
G. luteoalbum	0	*glabres*, chagrinés	etwas rauh
G. uliginosum	slätta, glatta	0	glatt
G. supinum	glest strëfhåriga	pubescents	kurzhaarig
G. silvaticum	småhåriga	0	kurzhaarig
G. norvegicum	"	0	spërlich behaart

The achenes of *G. uliginosum* are, as said, totally smooth and glabrous, differing widely from the three following ones. In the last three species they are conspicuously pubescent with straight, slightly ascending hairs. In the swollen state the upper parts of the hairs are glassy-hyaline, and by enlargements from 200 × upwards a longitudinal division is seen (see fig. 4, a and b). In *G. supinum* the pubescence is remarkably denser and the individual hairs longer, 0.13–0.15 mm., whereas in *G. silvaticum* and *G. norvegicum* they are 0.08–0.09 mm. only. The difference in the density suggested by Hegi I cannot see, nor is it noted in other Scandinavian floras. Also here the trans-

verse cells are not opposite, just as in *Antennaria*. Even after several days swelling no splitting of the terminal cells occur and no mucilage is seen. The hairs are thus evidently "duplex-hairs" but different in type from those of *Antennaria*.

The achenes of *Leontopodium alpinum*, by HEGI called "rauh," carry twin hairs of exactly the same type as *Gnaphalium*, 0.08–0.09 mm. long and perhaps slightly thicker (see FIG. 4, c). As in *G. supinum* the lower part is much shorter than the upper.

ANAPHALIS MARGARITACEA var. SUBALPINA. The young and quite immature achenes carry a *dense* covering of short, 0.05 mm. long, twin-hairs of the *Gnaphalium* or *Leontopodium* type.

The following species would, judging by the descriptions given, probably be inviting objects for comparison, but are unavailable here:

	HARTMAN	ROUY	HEGI
HELICHRYSUM ARENARIUM	0	chagrinés	sehr feinknotig
HELICHRYSUM ITALICUM	0	0	warzig rauh
FILAGO GERMANICA	hvitprickiga	finement glanduleux	0
FILAGO GALLICA	0	0	mit dicken glashellen Warzen besetzt

Instead I have studied mature achenes of *Filago arvensis*, of which nothing is said in the floras, but which in dry state would agree well with HEGI's description of *F. gallica:* covered with coarse, hyaline warts. Indeed they are a coarser representation of the "papillose" achenes in *Antennaria*. When swollen they appear like FIG. 4, d, often growing in clusters of twos or threes, which in drying shrink together to form the "wart." They project only 0.04–0.05 mm. from the epidermis.

Amongst the few species studied we thus found the achenial hairs most similar to those of *Antennaria* in a genus which in the adopted system is not considered the nearest relative of our genus.

At the end of this little investigation the author realizes too well its defectiveness. Yet, he hopes that the results obtained will suggest that the achenes of the great number of *Antennarias* already described and of those still to be proposed as new may be scrutinized for their achenial hairs and that investigations of the organs in related or ancestral genera may be taken up where ampler material and literature are at hand. The fact that glabrous and "papillary" species exist, both in great numbers, may perhaps suggest a polyphyletic origin

of the genus as we now understand it. The high number of chromosomes known for *A. dioica* and *A. alpina* also seem to speak for hybridogen origin.

Disko, Greenland.

THREE ANTENNARIAS FROM GREENLAND[1]

M. L. Fernald

Antennaria **affinis**, n. sp., humifusa, stolonibus foliosis (ad 4 cm. longis); foliis basilaribus spathulato-cuneatis apice subtruncatis vel late rotundatis vix mucronatis 6–13 mm. longis 2.5–6 mm. latis utrinque albidis pannoso-tomentosis; caule florifero 3–14 cm. alto; foliis caulinis 6–9 subdistantibus, imis anguste oblanceolatis obtusis, mediis linearibus acutis mucronatisque 8–13 mm. longis 2 mm. latis, superioribus 1–2 apice subscarioso subulato vel involuto 0.5–1 mm. longo munitis; capitulis femineis 1–15 dense corymbosis vel glomerulatis turbinato-campanulatis; involucro 5–5.5 mm. alto basi lanato subviscoso; bracteis 2–3-seriatis margine erosis, exterioribus late oblongis obtusis stramineis basi fulvescentibus, interioribus lanceolatis acutis apice ochroleucis; corolla 4–4.5 mm. longis, apice purpurea; stylo incluso vel vix exserto; achaeniis 0.8 mm. longis minute papillosis; foveis receptaculi ovoideo-conici maturi denudati 60–100 0.1 mm. latis quam jugis separantibus obtusis latioribus; planta mascula ignota.—Greenland: Ipiutarssuaq, 67° 42′, August 5, 1918, *M. P. & A. E. Porsild* (type in Gray Herb.); on basaltic moraines, S. Disco, Sinigfik, 69° 25′, August 12, 1929, *R. T. Porsild;* Kûk ("Kome"), 70° 36′, July 26, 1921, *A. E. Porsild;* sunny ledges, Agpat-formation, Umánaq Storø, Paornat, 70° 40′, July 8, 1929, *M. P. & R. T. Porsild;* Umánaq, August 25–30, 1923, *Elizabeth Ekman;* on sunny ledges of the Agpat-formation, Upernavikø, 71° 15′, July 14, 1929, *M. P. & R. T. Porsild;* Upernavik, 71° 20′, July 23, 1921, *A. E. Porsild;* all the Porsild collections distributed as *A. subviscosa* Fernald.

As stated, *Antennaria affinis* was distributed as *A. subviscosa* Fern., but it is not satisfactorily identified with the latter species which is known only from Bic, Rimouski County, Quebec, and from three stations in Gaspé County (Marsouin River, Cap Pleureuse and Gros Morne), where, with other relic species, it occupies shelves of vertical

[1] At the request of the late Professor Ostenfeld the description of the first species was sent to him for publication in Denmark. Owing to Dr. Ostenfeld's most regrettable and untimely last illness publication of the paper was overlooked. Dr. Porsild has most kindly supplemented the original material by beautiful specimens of additional numbers, as well as by two other species heretofore unknown in Greenland. One of the latter is here described; the other, too mature for exact identification, must await younger specimens.

calcareous sea-cliffs which remained nunataks during the Wisconsin glaciation. In *A. subviscosa* the cauline leaves are more generally acute, all but the basal ones acuminate or attenuate, the lower sharply mucronate, the 4–7 median and upper ones with slender subulate or involute, straight or unguiculate appendages 1.5–3 mm. long; the cauline leaves of *A. affinis* being blunt, or the upper merely acute, only the uppermost 1 or 2 with a short (0.5–1 mm. long) subulus. The basal leaves of *A. affinis* are broader and more rounded at tip than in *A. subviscosa* and with more pannose pubescence.

A. brevistyla, n. sp. humifusa, *A. vexilliferae* similis; foliis basilaribus anguste cuneato-obovatis 6–7 mm. longis apice rotundato 2.2–3 mm. latis vix vel brevissime mucronulatis albido-tomentulosis, tomentulo coactili; caule florifero 6–7 cm. alto; foliis caulinis 6–7 subdistantibus anguste lanceolatis vel lanceolato-linearibus 6–8 mm. longis 1.5–2 mm. latis, superioribus 4–5 apice scarioso late lanceolato plano 1.5–2 mm. longo munitis; capitulis femineis 4 glomerulato-corymbosis; involucro 5.5–6 mm. alto basi lanato; bracteis 20–30, 2–3-seriatis subaequantibus fulvescentibus, exterioribus oblongis obtusis vel subacutis, interioribus angustioribus acutis; corolla 4 mm. longa; stylo incluso vel breviter exserto subintegro; achaeniis glabris 1.3–1.5 mm. longis.—GREENLAND: on barren sandstone hills, S. Disco, Nûk Øst for Marraq, 69° 25′, August 13, 1929, *R. T. Porsild* (TYPE in Gray Herb.).

Antennaria brevistyla strongly simulates *A. vexillifera* Fernald of the Shickshock Mountains of Gaspé and the limestone barrens of northwestern Newfoundland. All the collections of *A. vexillifera* (from four distinct areas) are consistent in having the styles long-exserted from the corollas and deeply 2-cleft. In the Greenland *A. brevistyla*, however, the styles are included or barely exserted and much less cleft. This character seems to be very consistent in other northern species: the included or but little exserted and only slightly cleft styles occurring in *A. intermedia* (Rosenv.) Porsild of Greenland, in *A. affinis* (described above), in *A. isolepis* Greene of the Labrador Peninsula, in *A. subviscosa* Fernald of the Gaspé region and in *A. umbrinella* Rydb. of the Rocky Mountains; but the greater number of boreal species have well-exserted and deeply cleft styles.

A. LABRADORICA Nutt. Trans. Am. Phil. Soc. n. s. vii. 406 (1841). *A. angustifolia* Elis. Ekman, Sv. Bot. Tidskr. xxi. 53, t. i. figs. 1, 2, 12 (1927), not Rydb. Bull. Torr. Bot. Cl. xxvi. 546 (1899). *A. Friesiana* Elis. Ekman, l. c. xxii. 416 (1928), at least as to the Greenland plant, perhaps not as to name-bringing synonym, *A. alpina*, var. *Friesiana* Trautv. Act. Hort. Petrop. vi. 24 (1879).

The identity of *Antennaria labradorica* Nutt. has long remained unsettled. In the summer of 1930, however, Dr. M. O. Malte and I found in the herbarium of the British Museum of Natural History three fragments from Nuttall, which, until a fuller specimen is located, must stand as the type of the species. The first fragment is a slender basal offshoot 1.7 cm. long, with linear-oblanceolate, acute (but not mucronate) densely canescent pilose-tomentose leaves 1–1.2 cm. long, 0.6–1.5 mm. broad. The other two fragments are two detached heads, lanate at base; the involucre 7 mm. high, with 2–3 series of subequal narrowly lanceolate to lance-linear long-attenuate fuscous to fulvous bracts (about 24 to a head), the inner bracts serrulate; corolla 3.6–4 mm. long, reddish-brown, with exserted style; achenes glabrous, 0.4 mm. long. This is the narrowest-leaved species of the "*alpina*" series, the plant described and beautifully illustrated by Mrs. Ekman as *A. angustifolia*. Whether *A. labradorica* includes *A. alpina*, var. *Friesiana*, as Mrs. Ekman believes, I am not yet able to determine. The geographic occurrence of the latter is rather against its being identical with a plant otherwise known only from northernmost Labrador and adjacent regions and from Greenland.

Gray Herbarium.

NOTES FROM THE HERBARIUM OF THE UNIVERSITY OF WISCONSIN—VII

Norman C. Fassett

For three years transplanted specimens of the plant described by the writer as *Dodecatheon Meadia* var. *amethystinum* have been closely observed in their development from early bud to mature fruit, and 15 individuals are now growing in his garden beside almost as many of the typical *D. Meadia*. The slender habit and brilliant flowers of the former plant give it an appearance so striking that additional characters have been sought on which to differentiate it from the common species of the Middle West. These have been found in the texture and proportions of the fruit, and the length of the floral parts, and appear to warrant the proposal of specific rank for the plant of the Mississippi River bluffs.

Dodecatheon amethystinum (Fassett) n. comb. *D. Meadia* var. *amethystinum* Fassett, Rhodora xxxi. 52 (1929). Plant slender, 2–3.5 dm. high; corolla-lobes constant in color, deep violet (rarely white

but without pale intermediates) becoming when pressed dark bluish-purple; flowers 2–11(–18) in an umbel; calyx-lobes not over ⅓ the length of the expanding corolla, 3–4.5 mm. long on the mature fruit; anthers 5–7.5 mm. long; capsule narrowly cylindric, 10–16 mm. long and 3–4.5 mm. thick, stramineous, with thin, almost papery walls, its valves 1.4–2 mm. long; seeds light castaneous or olive-brown.—Bluffs along the Mississippi River from Alma to the southern border of Wisconsin, and up some tributaries for about 12 miles. It has been collected at Winona, Minnesota, and will undoubtedly be found in northern Illinois and Iowa where they border the river in The Driftless Area.

D. Meadia L. Plant stout, 2.5–6 dm. high; corolla-lobes with every shade from white to pale lilac, rarely deep lilac; flowers usually 6–30 in an umbel; calyx-lobes at least ½ the length of the expanding corolla, 4–6.4 mm. long on the mature fruit; anthers 7–9 mm. long; capsule castaneous, ovoid-conical, 10–15 mm. long and 5–7.5 mm. thick, of firm subligneous texture, its valves 2–2.6 mm. long; seeds dark brown or nearly black.

Studies in the field and in the herbarium show that *D. amethystinum* flowers at least a week earlier than does *D. Meadia*. The type was collected by the writer at Prairie du Chien, Wisconsin, on June 2, 1928, and bore well-developed fruit, with only a few withered corollas persisting. The next day, *D. Meadia* was collected near Gays Mills, about 25 miles northeast of Prairie du Chien, but only about 10 miles east of the Mississippi River; it bore only 3 expanded flowers, and a large number of buds. A specimen of *D. Meadia* collected on May 30 of the same year, near Prairie du Sac, 100 miles east of the Mississippi, bore 2 very young fruits, 10 flowers, and at least 6 buds. In general it may be said that *D. Meadia* is coming into its prime on Memorial Day, while it is difficult to find *D. amethystinum* still in flower at that time.

D. Meadia is a plant of meadows, lightly wooded ground, and particularly of railroad rights-of-way. *D. amethystinum*, on the other hand, is almost entirely confined to mossy outcrops in cool damp woods on north-facing bluffs. Dr. C. H. Bunting, who first called my attention to this plant, has made the same observation in the vicinity of LaCrosse, as has also my student, Mr. Henry P. Hansen, of that city. The only collections made in open ground were by the writer, on May 2, 1931—nearly a month before *D. Meadia* came into flower. This was on the southwest-facing grassy or lightly wooded bluffs at Fountain City; at the same time this species was collected on the other side of the hills, in dense woods, where it had buds just expanding.

Plants collected at West Salem, Wisconsin, by Mr. N. W. Rowe, were at first considered as intermediate. West Salem is 13 miles east of the Mississippi River, in the valley of the LaCrosse River. Re-examination of Mr. Rowe's two specimens, both collected at the same time, shows one, in flower, to be fairly typical *D. Meadia*, while the other, in fruit, is *D. amethystinum*. Mr. Hansen, collecting at West Salem on June 7, 1930, found an abundance of *D. amethystinum* on shaded north-facing limestone cliffs, all in fruit. But the seeds are dark as in *D. Meadia*. A single plant has the robust habit and longer sepals of *D. Meadia*, but the capsule is rather slender, thin and light-colored. Since these are not so much intermediates as they are individuals combining the characters of the two species, they may be hybrids occurring where the ranges of the two overlap.

D. amethystinum is apparently a relic species in The Driftless Area, dating back to preglacial times. The whole problem of the preglacial relic flora in the Great Lakes states is a complex one, probably not to be completely solved on the basis of our present knowledge, but a few facts may be here reviewed. In the classic paper on this problem as it concerns the Gulf of St. Lawrence region, attention is called to certain plants of western America occurring locally in the vicinity of Lake Superior, on glaciated ground. It is suggested that these species survived the Wisconsin glaciation in The Driftless Area, later to migrate northward from a region "too hot and dry for the plants which occupy the headlands and peninsulas of Lake Superior."[1] But "hot and dry" is hardly an adequate expression of conditions in The Driftless Area. Many south-facing bluffs, it is true, answer this description, and support a prairie vegetation, clearly derived from the southwest; here we find, to name only a few species, *Petalostemum purpureum*, *P. candidum*, *Coreopsis palmata*, *Bouteloua hirsuta*, *B. curtipendula*, *Artemisia caudata*, *A. frigida*, and *Solidago rigida*. Dry sandstone bluffs and sand-plains, largely covered with blueberries, are frequent. But conditions in the mossy woods of the north-facing bluffs and deep ravines may be judged by the fact that throughout The Driftless Area *Asarum canadense* and *Arisaema triphyllum* are of frequent occurrence. It is hard to conceive of *Rubus parviflorus* (abundant in northern Wisconsin), *Arenaria macrophylla* (rare on cliffs in the Gogebic Range of Ashland and Iron Counties), *Epipactis decipiens* (in Wisconsin occasionally found in woods along Lake

[1] Fernald, Persistence of Plants in Unglaciated Areas of Boreal America. Mem. Am. Acad. of Arts & Sci. xv. 317 (1925).

Superior), *Osmorhiza divaricata* (in Wisconsin known only from Port Wing, but in Michigan abundant in the Porcupine Mountains and reported from Isle Royale), *Viola adunca* var. *glabra* (dry open places, Ashland, May 23, 1930, *N. T. Bobb* no. 98), and *Potamogeton filiformis* var. *Macounii* (collected by the writer in Vilas County, new to the Great Lakes region) as having migrated northward in a body, leaving no traces, from a region where, on some exposed bluffs and damp walls of canyons we know such Canadian and Hudsonian plants as *Arctostaphylos Uva-Ursi* var. *coactilis, Moneses uniflora, Equisetum scirpoides, Pyrus dumosa* (more frequent in southwestern Wisconsin than is *P. americana*), *Pinus Banksiana, Acer spicatum, Primula mistassinica,* and *Rhodendron lapponicum.*

The apparently preglacial flora of northern Wisconsin and neighboring territory has its affinities with the Rocky Mountains, with the Gaspé Peninsula, and with the Torngat Mountains. There is another relic flora in The Driftless Area, spreading sometimes as far east as the Indiana dunes, which has its affinities mostly with regions south of the area of Wisconsin glaciation. *Talinum rugospermum,* on sandstone bluffs and sand-plains, is closely related to and has been confused with *T. teretifolium,* which ranges from Pennsylvania through North Carolina to Alabama.[1] These species are apparently of common descent, isolated in the two regions by glaciation. *Spiraea tomentosa* var. *rosea*[2] has a range very similar to the combined ranges of the two species of *Talinum,* occurring from northwestern Wisconsin and southern Minnesota to the Indiana dunes, and in West Virginia and North Carolina.[3] *Sullivantia renifolia,*[4] extending only slightly beyond the limits of The Driftless Area, has a relative south of the glacial limits in Ohio and Indiana, and four related species occurring very locally in the Rocky Mountains. *Aconitum noveboracense,* found toward the southern limit of glaciation in New York and Ohio, is represented in southwestern Wisconsin and adjacent Iowa by the very rare and local var. *quasiciliatum.*[5] *Elatine triandra,* not in The Driftless Area, but definitely related to it,[6] is a species of local occurrence in the West, and doubtfully native in Maine. *Geum triflorum* has apparently spread in the Middle West, extending westward to North

[1] See Rhodora xxx. 205–206 (1928).
[2] Fernald, Rhodora xiv. 190 (1912).
[3] Peattie, Rhodora xxiv. 87 (1922), calls this an endemic derivative of the coastal plain flora in Indiana, but it seems to the writer better considered as a preglacial relic.
[4] Rosendahl, Univ. Minn. Stud. Biol. Sci. no. 6: 410 (1927).
[5] Fassett, Rhodora xxxi. 49 (1929).
[6] See Trans. Wis. Acad. of Sci., Arts & Lett. xxv. 199–200 (1930).

Dakota and eastward to New York; it is represented in western North America by a plant considered by the writer to be only varietally distinct,[1] but has no affinity with the Gulf of St. Lawrence region. *Montia Chamissoi*, of the Rocky Mountains, but with no stations in the East, is known from a single locality in The Driftless Area.[2]

This distinct relic flora, practically confined to The Driftless Area, with several endemics, having its affinities in unglaciated areas to the westward or to the southeastward, may be clearly interpreted on the basis of lack of glaciation in southwestern Wisconsin. But the occurrence in the Lake Superior region of plants of the Rocky Mountains and of the Gulf of St. Lawrence area is a problem that cannot at present be solved with any degree of certainty.

Madison, Wisconsin.

Two Abnormalities of Podophyllum peltatum.—Last spring, while out botanizing, one of the members of my class ran upon the

Fig. 1. Podophyllum peltatum, f. aphyllum.

interesting specimen, a photograph of which is here shown (fig. 1). Instead of the regular two leaves, out of the fork of which grows the

[1] See Rhodora xxx. 206–207 (1928).

[2] See Holzinger, The Plant World iv. 41–43 (1901).

flower, this flower rose right out of the ground, directly from the apex of the rhizome without a trace of a leaf, other than the scales at the base of the scape. The flower was not different from the usual flowers of *Podophyllum peltatum* L., many of which were growing along with the abnormality and with sterile shoots and formed a fairly large patch. Seeing a Podophyllum flower growing right up out of the ground was most remarkable.

The abnormality brought to mind one observed a number of years ago in the fruit, such as one might expect to run across, at least occasionally. Instead of one single fruit, there were clusters of fruits. In one specimen there were 7 variously sized fruits, and in the other 5, the entire cluster in each case weighing 3 or 4 times as much as the average single fruit.

Whether common or not, it would seem appropriate to call the first cited case f. *aphyllum*.[1] The second has already received a name, f. *polycarpum* Clute, Am. Bot. xxi. 93 (1915).—Charles C. Plitt, School of Pharmacy, University of Maryland, Baltimore, Maryland.

Moss Flora of North America.—The second part of Dr. Grout's new moss-flora[2] has appeared during the summer. It is gratifying to learn that subscriptions and other forms of encouragement seem to justify continued publication. Part 2 is of the same high grade as Part 1 (reviewed in Rhodora **31:** 38–39) and includes the genera *Leptodictyum, Amblystegium, Hygroamblystegium, Sciaromium, Cratoneuron, Campylium, Hygrohypnum, Scorpidium, Calliergon, Calliergidium, Calliergonella* and *Drepanocladus*. For the excellent illustrations the author has reproduced many figures from such well-known authorities as Bruch & Schimper, Limpricht, Sullivant, Dixon & Jamieson, Jennings, Husnot, and others. Apparently when suitable material for illustrative purposes from such sources was not available original drawings have been made. The grouping in some of the plates of the characteristics of nearly allied species or forms will undoubtedly facilitate ready comparison. We trust that future parts will now appear with reasonable regularity.—J. F. C.

[1] Podophyllum peltatum L., f. **aphyllum,** f. nov., caule sicut scapo foliis nullis. Fig, 1.

[2] A. J. Grout, Ph.D. *Moss Flora of North America, North of Mexico*, Vol. III, Pt. 2, pp. 63–114, pls. XV–XXIX. June, 1931. Published by the author, 1 Vine St., New Brighton, Staten Island, New York City. Price $2.50.

The American Lotus at West Peabody, Massachusetts.—In Rhodora, April, 1916 (vol. 18), p. 90, the American Lotus (*Nelumbo lutea* (Willd.) Pers.), is recorded from West Peabody (George Larrivee, Aug. 14, 1913) and it is also stated that "a large colony of it is well established in a small pond near the railway in Lynnfield Center (J. Richard Lunt, Aug. 24, 1915)." Do these records by any chance refer to the same place?

This plant has been known to local flower-lovers and botanists for a long time to be well-established in the so-called Lily Pond or "Devil's Dish-bowl" just north of the railway in West Peabody. Recently (Aug. 20, 1931), I visited the place and secured specimens for our herbarium, and also talked with Mr. Daniel Brown of Peabody, who was instrumental in introducing it there. He told me that about 60 years ago, i.e., about 1870, a Mr. Silver of Salem, a sportsman interested in shooting, procured from South Carolina a lot of wild rice (*Zizania aquatica* L.) and that he (Brown) sowed a half bushel or more around the shores of the Lily Pond (which, by the way, is owned privately) in order to attract ducks. There were probably seeds of the lotus among the wild rice, —at all events, a year or two later it made its appearace in increasing amounts and has persisted till the present time. Now, a drive along the road at the north side of the pond in August reveals a very attractive floral display, the huge, upstanding lemon-colored blossoms and circular leaves imparting an almost tropical luxuriance to the spot.—Albert P. Morse.

Peabody Museum of Salem.

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NOTICE TO CONTRIBUTORS

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STATE OF WASHINGTON PLANTS

During a partial botanical survey, I have collected a few extra sets for sale at the usual prices. Many are from type localities, especial attention having been given this year to the Olympic and Wenatchee Mountains.

Correspondence invited.

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